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LETTERS TO THE EDITOR.

* * The attention of scientific men is called to the advantages of the correspondence columns of SCIENCE for placing promptly on record brief preliminary notices of their investigations. Twenty copies of the number containing his communication will be furnished free to any correspondent on request.

The editor will be glad to publish any queries consonant with the character of the journal.

Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.

The Keweenaw System.

THE geologists interested in the discussions that have taken place during the past eight years, concerning the relations of the Eastern sandstone to the copper-bearing rocks of Keweenaw Point, will remember that one of the important localities showing that relation is situated on the Hungarian River. In company with James Osborne, F.G.S., superintendent of the Rio Tinto mines in Huelva, Spain, and William Beer of the Osceola Mine, I have revisited this locality. Owing to some changes in the bed of the stream, we are able to trace continuously the unchanged Eastern sandstone into the sandstone which has been baked and indurated by the old lava-flow, and this baked sandstone into the lava-flow or melaphyr itself, all forming a continuous exposed surface. There is no fault or plane of separation between the sandstone and trap, but the two are welded together into one mass. We procured hand specimens, which in one piece show the contact of the so-called 'Keweenaw' system with the Eastern sandstone. The contact is that made by a lava-flow with an underlying sandstone, and is the same as the contacts so often observed within the copper-bearing series, while the sandstone is observed *in situ* to pass beneath the melaphyr. It is my purpose to uncover the contact junction still further, and to publish in time a paper giving sections and detailing results at this and other localities at which the contact has been observed. The above observations sustain fully those made by myself in 1879; and in this case it would seem to forever settle, beyond any possibility of doubt, that the Keweenaw system and the Eastern sandstone are one and the same continuous geological formation, but with the copper-bearing rocks younger in point of time than the sandstone.

M. E. WADSWORTH.

Michigan Mining School, Houghton, Mich., Sept. 19.

Cause of the Purple Coloring of Pigweed-Leaves.

DURING a number of years past I have frequently been struck by a prevalent purple coloring of patches in the leaves of pigweed (*Chenopodium album*), the cause of which did not appear in any surrounding conditions, and up to this summer it has remained to me a mystery. A few weeks ago, however, while examining pigweed in search more particularly of plant-lice and leaf-miners, I again noticed the leaf-coloring, and, upon turning up some of the colored leaves, found on some of them larvæ of a leaf-hopper having the same shade of purple as the colored spots on the leaves. Further examination brought to light more of the larvæ, always on the under surface of the leaf, and within one of the colored spots. Some of the spots were found without any larvæ visible, indicating that they travel about more or less, or that they had been disturbed and had made use of their legs to get out of the way. A few days later (July 25) I examined plants in another locality similarly affected, and found, as before, the colored larvæ associated with the spots. On one leaf, I found close by the cast-off pupa-skin, which still retained enough of the markings to show its relation to the larvæ (an adult), which, on comparison, proved to be the *Thamnotettix seminudus* of Say, — a species rather common throughout the country, but which, so far as I can find, has never been mentioned in connection with its food-habits or larval life. No such coloring results from the presence of plant-lice or other insects on the same plant, and it seems quite certain that we may consider this species as the cause of the peculiar phenomenon. I am not aware that any explanation has previously been given. What kind of secretion is injected into the leaf by the insect, when puncturing it to obtain its food, and how that acts to change the color in the plant-cells, are still open questions. It is evident that the simi-

larity in color of the spots and the larvæ are a protection to the latter.

HERBERT OSBORN.

Zoöl. Lab. Agric. Coll., Ames, Io., Sept. 20.

The Ordinates of Interest in Science at the American Association.

THE oscillations of interest in branches of science, and the rise of, and rapidly increasing interest in, the more recent and sometimes the less difficult departments of learning, as well as the apparent stagnation in the pursuit of science either locally developed or affecting larger areas of population, have been often remarked. It might seem reasonable to suppose that we might be able to review with approximate accuracy the ebb and flow of the scientific tide by watching the fluctuations of study in a representative and national body of scientific workers; in such assemblages as the American, French, and English Associations present us with, where no discriminations are made, and students of all grades and inclinations are welcomed.

The obvious and feasible method to adopt for this purpose would be to note the varying number of papers by different authors in the several classes of study, and compare their aggregates distributed over a number of years. This method we have used here, and yet a little reflection will show that it is deceptive, and possibly in instances leading to quite wrong conclusions. In the first place, while the names of all scientific men in these countries, as a rule, are found on the rolls of these associations, they may, for reasons of convenience or personal comfort, or because they are associates of smaller and more technically limited bodies, choose to publish or read their papers elsewhere. In the second place, many conscientious workers cannot enjoy the opportunity of attending the meetings of the association, and, while authors in a modest way, would be deterred from appearing upon so prominent a platform, though they become members of the association for the sake of enjoying its publications and the pleasure of its recognition. Again, the 'ambulatory' habits of the association may carry it this year into a hot-bed of geologists or in their neighborhood, and in another move it to the hunting-grounds of archaeology; so that the method is defective as permitting just inferences as to the fashion or currents of scientific investigations in the association itself, and more evidently as regards the wholesale aspect of national scientific industry.

And yet, with all deductions made, there is a residuum of interest in the results of this examination. They show how evenly in some branches the 'show of hands' at the annual meetings of the association has been kept up, in others how the interest has fallen under the entire average for years, and again risen by a recuperative effort much above it; they give an idea, at least, how some lines of study exceed others in their active participants in the association, and a measure of the rising importance or popularity of others.

In computing the charts, the whole number of papers by different authors in each department has been taken, and their percentage of all the papers read or accepted, by different authors, used to fix the point of interest in the column corresponding to the number of the meeting quoted. Where an author has prepared a paper on two or more subjects, he is regarded as representing a unit of interest in each; but where he has offered a number on one subject, his activity entitles him to no further recognition, for our purpose, than the single contributions of others. The points of interest are measured from the base-line, and are meant to be strictly comparable; so that the greater general height of one series exhibits the preponderating value of that study. The determination of the proper reference of a paper is in some cases not easy, and the lines might in many ways be changed by a redistribution of the papers, according as the statistician thought the contents of a paper shifted it to a different though allied topic.

Of course, the actual number of papers by different authors in one subject may remain constant, while the percentage of interest would show a decrease, from the re-enforcement of other departments and the consequent larger aggregate of individual papers upon which to reckon. The most instructive conclusions, it seems to us, are drawn from the relative position of the average line of interest, in the different subjects, to the maxima and minima points